STATUS OF THE DEPARTMENT OF ENERGY
NUCLEAR CRITICALITY SAFETY PROGRAM
FOR CALENDAR YEAR 2003

1. Introduction

In closing Recommendation 97-2, *Criticality Safety*, the Defense Nuclear Facilities Safety Board (DNFSB) established an annual reporting requirement and specified several specific areas of interest. In the body of the closure letter, the following was requested: "...the first annual report should include the results of a comprehensive review of the effectiveness of the actions that the Department of Energy (DOE) has taken to improve nuclear criticality safety in response to Recommendation 97-2, DNFSB/TECH-29, and the DNFSB letter of July 20, 2001, with particular attention to whether these improvements have been institutionalized within the Nuclear Criticality Safety Program." An enclosure to the DNFSB letter requested a status of the following:

- A copy of the Updated Nuclear Criticality Safety Program (NCSP) Five-Year Plan.
- NCSP Funding (actual and projected).
- Critical experiments status and Los Alamos National Laboratory (LANL) Technical Area (TA)-18 Relocation
- Program status.
- The status of contractor criticality safety engineer training and qualification programs.
- The status of Federal criticality safety engineer training and qualification programs.
- A summary of lessons learned from criticality safety program assessments.
- A summary of lessons learned from Criticality Safety Support Group (CSSG) reviews.
- A summary of the results of trending and analysis of reportable and non-reportable criticality safety occurrences.
- The status of open issues identified in the previous annual report.

This annual report is structured to address each of these areas in the order in which they appear in the DNFSB August 7, 2003 letter and its enclosure.

2. Effectiveness of actions DOE has taken in addressing Recommendation 97-2

The DOE began implementing DNFSB Recommendation 97-2 in January 1998 by addressing each of the 30 commitments made in the Implementation Plan and formally establishing the NCSP. The effectiveness of the DOE response to Recommendation 97-2 and a discussion of how actions have been institutionalized are presented in this section.

Commitment 6.1 required the DOE to reexamine the experimental program in criticality research and provide a report. This commitment was completed in March 1998, but the process established to meet the commitment endures. Every year the list of priority experiments is re-

evaluated and updated to ensure the most pressing programmatic needs are being met. New requirements are also considered as they arise. The Nuclear Data Advisory Group (NDAG) plays a key role in this process because of its unique perspective; it reviews programmatic needs for all nuclear data, differential and integral, and provides recommendations to the CSSG regarding data priorities. The CSSG recommends reprioritization of experimental needs to the NCSP Manager based on criticality safety community feedback and NDAG recommendations. Re-evaluation and prioritization of experimental needs have been institutionalized through the NCSP Five-Year Plan review and approval process, and NDAG/CSSG involvement ensures that the experimental program is responsive to the needs of the criticality safety community. During the past decade, significant progress has been made in performing the highest priority experiments and in providing quality benchmarks for those experiments to the community through the International Criticality Safety Benchmark Evaluation Project (ICSBEP) in a timely manner. Appendix F of the NCSP Five-Year Plan (attached) contains the schedule of integral experiments.

These actions effectively address the DNFSB sub-recommendation 1 of Recommendation 97-2 that the experimental program be structured to emphasize determination of bounding values for criticality of systems most important in the current programs at DOE facilities.

Commitment 6.2.1 and its five sub-commitments required the DOE to perform a Criticality Safety Information Research Center (CSIRC) pilot program. The five sub-commitments were completed by October 30, 1998. Letters dated February 2, 1998, and March 30, 1998, to Chairman Conway described the experiments conducted in 1968 and associated logbooks that were archived under this pilot program. A letter dated October 30, 1998, to Chairman Conway reported that data and calculations from these experiments have been published on the LANL web site (http://www.csirc.net). This pilot was effective in establishing the foundation for the CSIRC Program that is now institutionalized in the NCSP Five-Year Plan.

Commitment 6.2.2 and its three sub-commitments required continuation of the CSIRC program. This Program is continuing as a part of the NCSP. A February 23, 1999, letter to Chairman Conway reported completion of screening existing logbooks with original authors/experimenters. A May 26, 1999, letter to Chairman Conway provided the first CSIRC program plan to preserve primary documentation supporting criticality safety information and to make this information available for the benefit of the technical community. This information included not only experimenters logbooks, notes, drawings, photographs, and material descriptions from those sites at which critical experiments were conducted in the past, but also company reports and internal memoranda, which might be of benefit to future criticality safety engineers. The CSIRC program has proved to be very effective in preserving and archiving old experimental data. Criticality safety engineers from several sites have extracted relevant data from the CSIRC archive and used these data in preparation of more than 60 criticality safety benchmark evaluations for the ICSBEP.

Other important elements of the CSIRC Program are maintenance of the criticality safety accident report (LA-13638) and the Heritage Video Series. The latest edition of LA-13638 includes detailed analyses of 22 criticality accidents that occurred in the United States (7), the Russian Federation (13), the United Kingdom (1), and Japan (1). This document has become the definitive reference on criticality accidents and is used extensively in training. Regarding the Heritage Video Series, a number of criticality safety pioneers and experimenters have been videotaped at LANL and Oak Ridge National Laboratory as they recant the historical evolution of what have become accepted practices and in many cases regulatory norms. These video recordings have been made available in VHS and DVD formats and are being used primarily as training enrichment material. Preservation and dissemination of this information provides insights into the development of criticality safety culture as codified in the American National Standards Institute/American Nuclear Society (ANSI/ANS) 8 Series of standards. The CSIRC status and planned activities are contained in Section 7 of the NCSP Five-Year Plan (attached).

The continuing CSIRC program effectively addresses the DNFSB sub-recommendation 2 of Recommendation 97-2 that records of calculations and experiments be organized to ensure that past problems in criticality safety are not repeated and that information from past operations be accessible for similar future operations.

Commitment 6.3 and its two sub-commitments required the DOE to continue and expand work on the Oak Ridge National Laboratory sensitivity methods development. An October 30, 1998 letter to Chairman Conway provided the first program plan for the Applicable Ranges of Bounding Curves and Data (AROBCAD) Project and a May 26, 1999 letter provided details of the initiation of the AROBCAD program plan. The AROBCAD development effort is managed as part of the NCSP. The first formal issuance of AROBCAD production-software is scheduled for early calendar year 2004 with subsequent issuance of stand-alone software and usage guidance reports. This software will be institutionalized as part of the Standard Computer Analyses for Licensing Evaluation family of codes, and it is anticipated that it will prove to be an extremely useful new code. AROBCAD will improve the effectiveness of operational criticality safety programs by providing consistent and mathematically justifiable capabilities to rigorously quantify the following: criticality safety evaluations; computational and experimental uncertainties impacting criticality safety evaluations; applicability of critical experiment benchmarks for validating criticality computational methods for safety evaluations; confidence in safe margins of subcriticality for safety evaluations; appropriate additional subcritical margin penalties for lack of "full-coverage" with benchmarks relative to a safety evaluation; identification of experimental needs relative to production throughput; experimental design assistance to assure relevance of experiments for safety evaluations; and determination of safely bounding subcritical parameters for criticality safety. Those capabilities will allow a rational balance among process-designs and production throughput as they relate to the degree of subcriticality quality assurance for nuclear criticality safety. More detail on AROBCAD development is contained in Section 2 of the NCSP Five-Year Plan.

The continuing AROBCAD program effectively addresses sub-recommendation 3 of

Recommendation 97-2 that a program be established to interpolate and extrapolate existing calculations and data as a function of physical circumstances that may be encountered in the future, so that useful guidance and bounding curves will result.

Commitment 6.4 required the DOE to make available evaluations, calculational studies, and data by establishing searchable databases accessible through a DOE Internet web site. The NCSP has institutionalized several criticality safety-related web sites. Hyperlinks between these sites and other related sites provide ease of access to a myriad of useful information that was only available in hard copy and difficult to obtain as little as a decade ago. An August 4, 1998, letter to Chairman Conway reported establishment of the DOE criticality safety web site managed by Lawrence Livermore National Laboratory and currently located at http://ncsp.llnl.gov/. This web site is monitored by the NCSP and routinely updated. LANL also has a criticality safety web site located at http://crit-safety.lanl.gov/ncs/index.htm. An October 30, 1998, letter to Chairman Conway reported that the database of Y-12 nuclear criticality safety evaluations is located on the Los Alamos criticality safety web site. The compilation of parameter studies into a database was accomplished by the Parameter Study Work Group and made available to the user community in 1995 on discs. The Parameter Study Working Group Database became known as the Hanford Database. A February 23, 1999, letter to Chairman Conway reported that this database was available on the NCSP web site as of December 1998. Funding for updating and improving the Hanford Database was reestablished in FY 2002. Finally, the ICSBEP website located at http://icsbep.inel.gov/ is maintained by the ICSBEP Project Manager at the Idaho National Engineering and Environmental Laboratory and funded by the NCSP. Based on criticality safety community feedback, these databases provide a very effective system for information preservation and dissemination and have enhanced operational criticality safety programs.

These actions effectively address sub-recommendation 4 of Recommendation 97-2 to collect and issue experimental and theoretical data as guidance for future activities.

Commitment 6.5.1 required the DOE to revise and reissue DOE-STD-3007-93. An October 30, 1998, letter to Chairman Conway reported that DOE-STD-3007-93 CN 1, *Guidelines for Preparing Criticality Safety Evaluations at Department of Energy Non-Reactor Nuclear Facilities,* was revised in September 1998. The revision included examples of criticality safety evaluations emphasizing the use of hand calculations and comparative analysis to existing data.

Commitment 6.5.2 required the DOE to issue a guide for the review of criticality safety evaluations. A November 4, 1999 letter to Chairman Conway reported that the review guide was issued as DOE-STD-1134-99, *Review Guide for Criticality Safety Evaluations.*

Commitments 6.5.1 and 6.5.2 of the DOE Implementation Plan were developed to promulgate guidance and examples to promote the use of simple, bounding methods of analysis in place of detailed computational analysis, where possible, in setting criticality limits for processes. Both sets of guidance are captured in the DOE directive system as DOE-STD-3007-93 CN 1 and

DOE-STD-1134-99. In addition, the standards for training and qualifying criticality safety engineers (contractor and DOE) require a working knowledge of DOE-STD-3007-91 CN 1. The training and qualification standards also explicitly require criticality safety engineers to demonstrate competence in the use of hand calculations as well as other computational methods. Therefore, the corrective actions have been institutionalized.

Regarding the effectiveness of these measures in enhancing operational criticality safety, the DOE performed several comprehensive reviews of various criticality safety programs (e.g., in response to the Tokai-mura criticality accident) since 1999. There have been no findings or concerns in any of the DOE Office of Environment, Safety and Health (EH)-led reviews related to over-reliance upon Monte Carlo methods or related to inefficiencies induced in the system by excessive analysis. The issue is no longer a concern because of multiple remedies [e.g., criticality safety engineers have become more experienced; DOE criticality safety staff have been trained and qualified and no longer demand so many complex calculations; the fissile systems being analyzed have become somewhat simpler over time as in the case of the Office of Environmental Management (EM) closure sites.] The actions taken to address the issue have been effective.

Commitment 6.6.1 required the DOE to expand the existing five-day training course at the Los Alamos Critical Experiments Facility (LACEF). A November 4, 1999 letter to Chairman Conway reported that the first expanded LACEF course was held the week of August 23, 1999. An improved course was held the week of February 14, 2000, that incorporated feedback from the initial course. This new five-day course, developed to supplement the existing five-day course, continues to be offered every year. During 2000 and 2001 demand for both five-day courses was high as Federal and contractor criticality safety engineers attended these courses to satisfy formal qualification requirements. During the past two years, attendance has declined because the initial qualification surge is over. Currently, each of the five-day courses is conducted only once annually and attendance for each of these courses is approximately 6-12 individuals. This level appears to be consistent with the number of individuals entering the criticality safety field annually. In addition to the five-day courses, LANL conducts four three-day criticality safety classes per year, one of which is reserved for individuals without clearances. These classes are geared towards fissile material handlers, operations managers, and more senior managers, who require a more general understanding of criticality safety to do their jobs. Approximately 30 to 50 individuals attend these three-day courses annually. Based on feedback from the criticality safety community, the hands-on training offered at LANL is extremely effective in supplementing criticality safety training conducted at the sites.

Commitment 6.6.2 and its two sub-commitments required the DOE to survey existing curricula in criticality safety and initiate a program that addresses identified needs. An August 4, 1998, letter to Chairman Conway documented the results of an assessment that included a complete criticality safety practitioner job task analysis. Existing curricula in criticality safety (e.g., LANL courses, university courses, site-specific criticality safety curricula.) were surveyed to determine whether identified needs can be met though utilization of existing training or if

development of new training is required. The assessment concluded that several available programs would be appropriate for general nuclear criticality safety personnel. These include courses at the University of New Mexico, the University of Tennessee, and the LANL hands-on nuclear criticality safety training courses. It was determined that many of the needs of the criticality safety community could be met with existing curricula and that gaps in specific areas could be addressed most efficiently through the development of Nuclear Criticality Safety Engineer Training (NCSET) modules. NCSET module development is institutionalized within the NCSP Five-Year Plan and funded by the NCSP to produce one or two modules per year. The 12 NCSET modules are available through the NCSP web site (http://ncsc.llnl.gov/) and remain the most downloaded items on the web site (several hundred downloads per year). The Training Development Working Group (subcommittee of the CSSG) oversees NCSET module development and makes recommendations to the CSSG on development of other training resources based on identified needs. Given the number of downloads from the Lawrence Livermore National Laboratory criticality safety web site and positive feedback from the criticality safety community, this activity has proved to be a very effective way to augment criticality safety training curricula.

Commitment 6.6.3 and its four sub-commitments required the DOE to survey existing contractor site-specific qualification programs, issue guidance for site-specific criticality safety training and qualification programs, and obtain commitments from contractors to implement criticality safety training and qualification programs. An August 4, 1998, letter to Chairman Conway contained the results of a survey that identified elements of existing site qualification programs. The purpose of the survey was to assist in determining elements essential to an adequate training program. A November 4, 1999, letter to Chairman Conway reported that guidance was issued as DOE-STD-1135-99, *Guidance for Nuclear Criticality Safety Engineer Training and Qualification*. A February 22, 2001, letter to Chairman Conway described the completion of a page change to DOE O 420.1, *Facility Safety*, that contains a new requirement to implement a training and qualification program for criticality safety staff. A May 14, 2001, letter to Chairman Conway reported the completion of this commitment. The requirement to train and qualify contractor criticality safety engineers is institutionalized.

Commitment 6.6.4 and its two sub-commitments required the DOE to develop a training and qualification program for Federal criticality safety personnel and formally qualify Federal staff directly performing criticality safety oversight. A May 26, 1999 letter to Chairman Conway described the Training and Qualification Program (TQP) developed for federal staff. A February 22, 2001, letter to Chairman Conway reported that at least one Federal employee at each site with a criticality safety program had been qualified to the DOE qualification standard. The requirement to train and qualify DOE criticality safety staff is institutionalized. The TQP was revised and reformatted into a new DOE Technical Standard in 2003. This revised and updated Criticality Safety Functional Area Qualification Standard (DOE-STD-1173-2003) was issued in December 2003. This standard did not change the technical substance of the qualification program but represented fundamentally a format change. It did update some ancillary expectations that will be addressed by line management as appropriate under individual

professional development plans at the site level. There is no need or intent to requalify individuals based upon issuing the TQP as a DOE technical standard. Further discussion of this topic is presented below in Section 9.

DOE actions taken in response to Commitments 6.6.1 through 6.6.4 effectively address sub-recommendation 6 of Recommendation 97-2 that a course of instruction in criticality and criticality safety serve as the foundation of a program of formal qualification of criticality engineers. The continuing actions have had a profound effect on training and qualification of Federal and contractor criticality safety personnel. Promulgation of DOE-STD-1135-99 and DOE-STD-1173-2003 provided necessary standardization as well as a sound foundation upon which to build criticality safety qualification programs. Sites have developed formal, documented criticality safety training and qualification programs in accordance with these standards and criticality safety personnel are being trained and qualified. An overarching goal of Recommendation 97-2 to establishing reliance on a group of formally trained and qualified criticality safety engineers at each site is being met.

Commitment 6.7 required the DOE to assess line ownership of criticality safety for each of its sites. This commitment was met in 1999. A February 23, 1999, letter to Chairman Conway provided details on the survey results. Individual site surveys were conducted to assess line ownership of criticality safety at Savannah River, Rocky Flats, Idaho, Chicago, Oak Ridge, and Richland. A letter dated May 26, 1999, to Chairman Conway reported that the Lawrence Livermore National Laboratory conducted a survey in conjunction with implementing Integrated Safety Management at Building 332 and that DOE Albuquerque staff completed surveys of line ownership of criticality safety at LANL, Sandia, and Pantex.

Line management ownership of criticality safety is demonstrated at several sites, in part, by their use of the criticality safety officer (CSO) function. These specially trained CSOs report directly to line supervision. They serve as the line's liaison with the nuclear criticality safety staff and usually perform such key functions as training operators on nuclear criticality safety limits, drafting criticality safety postings, attending pre-job briefings, performing criticality safety audits of operations, and responding to criticality safety deficiencies and infractions. The CSO function is implemented at Rocky Flats, LANL, Hanford, and Y-12.

The actions taken under Commitment 6.7 of the Implementation Plan effectively address sub-recommendation 7 of Recommendation 97-2 that criticality safety be assigned a staff function assisting line management, with safety responsibility residing in line management.

Commitment 6.8 required the DOE to form a group of criticality safety experts. A February 2, 1998, letter to Chairman Conway provided the charter of the CSSG. The charter is reviewed periodically and updated as necessary. The CSSG is formally institutionalized within the DOE NCSP and consists of persons from DOE and contractor organizations having collective knowledge in a broad spectrum of criticality safety areas. It is functioning in accordance with its charter and actively supporting the NCSP Manager's continued implementation of the NCSP.

Recently, at the request of the NCSP Manager, CSSG members began identifying young potential candidates for service on the CSSG in the future as current members retire. These individuals will begin shadowing their CSSG mentors and participating in all CSSG activities to gain experience prior to formal selection as members of the CSSG. The CSSG has been very effective in advising the NCSP Manager on NCSP implementation and in lending its expertise to address operational criticality safety issues upon request. Better leveraging CSSG expertise to assist line management is an issue that will require resolution and therefore will be carried forward as an open issue.

The formation and ongoing work of the CSSG effectively addresses sub-recommendation 8 of Recommendation 97-2 that a core group of criticality experts experienced in the theoretical and experimental aspects of neutron chain reactions be identified to advise and assist in resolving future technical issues.

Commitment 6.9 and its two sub-commitments required the DOE to charter an NCSP Management Team (NCSPMT) and develop an NCSP plan. The NCSPMT was chartered in 1998 and managed the NCSP until 2002, when Defense Programs decided to fully fund and manage the NCSP. At that time, the NCSPMT charter and function was assumed by an NCSP Manager in Defense Programs who reports directly to the program sponsor, the National Nuclear Security Administration (NNSA) Assistant Deputy Administrator for Research, Development and Simulation (NA-11), Defense Programs. Each of the seven NCSP Program Elements (Integral Experiments, Benchmarking, Analytical Methods Development and Code Maintenance, Nuclear Data, Training and Qualification, Information Preservation and Dissemination, and Applicable Ranges of Bounding Curves and Data) is dependent upon the others for a successful program. The NCSP is being conducted according to the NCSP Five-Year Plan, which is updated annually. A copy of the current Plan, dated November 2003 is attached. The NCSP has been institutionalized through integration with the Defense Programs' Readiness in Technical Base and Facilities budget. More detail on the budget situation is contained below in Section 6.

Management of the NCSP by the NNSA and establishment of formal funding plans within the NNSA budget effectively addresses sub-recommendation 9 of Recommendation 97-2 that the funding of the program be organized to improve its stability and to recognize the crosscutting importance of this activity.

3. Effectiveness of actions DOE has taken in addressing DNFSB/TECH-29

In response to DNFSB/TECH-29, the DOE took actions to enhance operational criticality safety programs. The effectiveness of the DOE response to DNFSB/TECH-29 and a description of how actions have been institutionalized are presented in this section.

The first suggested improvement in DNFSB/TECH-29 was to improve qualification of contractor and DOE criticality safety staff. The DOE issued a comprehensive training and qualification standard for contractor nuclear criticality safety staff, DOE-STD-1135-99, *Guidance for Nuclear Criticality Safety Engineer Training and Qualification*, and implementation of a training and qualification program was required by a subsequent revision to DOE O 420.1a. In December 2003, the Criticality Safety Functional Area Qualification Standard was revised and published as DOE-STD-1173-2003, *Criticality Safety Functional Area Qualification Standard*. The utilization of these qualification standards has institutionalized formal Federal and contractor criticality safety training and qualification processes within the DOE and served as an effective way to develop and maintain a cadre of criticality safety professionals. As stated in a previous section, DOE actions taken in response to Recommendation 97-2 in this area have had a profound effect on training and qualification of Federal and contractor criticality safety personnel. Promulgation of DOE-STD-1135-99 and DOE-STD-1173-2003 provided necessary standardization as well as a sound foundation upon which to build criticality safety qualification programs. An overarching goal of Recommendation 97-2 to establishing reliance on a group of formally trained and qualified criticality safety engineers at each site is being met. Sections 8 and 9 below provide a status of criticality safety qualification programs.

The second suggested improvement in DNFSB/TECH-29 was to increase criticality safety engineer time in operating areas. A workshop to share best practices for criticality safety engineer involvement in operations was held in Albuquerque on October 23-24, 2000. Ideas were developed for increasing nuclear criticality safety staff time on the floor and provided to the contractors at the workshop to include in their nuclear criticality safety improvement. Subsequent to the workshop, Field Office Managers were tasked to review the self-improvement plans of their contractors to ensure that these plans address the issue of criticality safety engineers spending an appropriate amount of time in operating areas. The DOE expectation that criticality safety engineers will spend an appreciable amount of time in operational areas is institutionalized in DOE-STD-1158-2002, *Self-Assessment Standard for Contractor Criticality Safety Programs*.

Two follow-up reviews (Savannah River Site and the Hanford Plutonium Finishing Plant) of site criticality safety programs indicate that the workshop was effective. The CSSG has concluded that DOE actions have been effective in increasing criticality safety engineer time in operating areas.

The third suggested improvement in DNFSB/TECH-29 was to decrease the over-reliance on procedural administrative controls over time. Institutionalization of this suggested improvement is achieved through contractor adherence to the following: DOE implementation guidance for 10 CFR 830, *Nuclear Safety Management*; DOE Order 420.1, *Facility Safety;* ANSI/ANS-8.1, *Nuclear Criticality Safety in Operations with Fissionable Material Outside Reactors*; and DOE-STD-1158-2002, *Self-Assessment Standard for DOE Contractor Criticality Safety Programs*. These documents reiterate the preference for engineered criticality safety controls over administrative controls in new nuclear facility designs and emphasize the need to design-in these controls rather than add them in after initial design and operation has begun. Examples of the effectiveness of this guidance are as follows: 1) the Pit Disassembly and Conversion Facility and its design rely primarily on engineered controls (active and passive) rather than administrative controls for criticality safety; 2) the design for the new storage vault at Y-12 relies heavily on the extensive use of fixed neutron absorbers; and, 3) operators of existing facilities at the Savannah River Site are being encouraged to identify possible engineered controls and formally disposition them as part of the routine criticality safety evaluation process.

The fourth suggested improvement in DNFSB/TECH-29 was to define the relationship between criticality safety evaluations/controls and authorization basis documents**.** This suggested improvement is institutionalized in10 CFR 830, *Nuclear Safety Management*, and the associated implementation guides. The CSSG provided input to EH on the implementation guides regarding this issue. EH met with the CSSG on three occasions to resolve the remaining open issues. After meeting with the CSSG at the New Orleans American Nuclear Society meeting, there are fundamentally only a few remaining issues. In January, 2004, the Energy Facilities Contractors Group (EFCOG) Safety Analysis Group, the DOE criticality safety community, and EH met in Albuquerque to continue discussions towards resolution. A path forward for resolving most of the issues was determined. The criticality safety community and EFCOG will issue their recommendations discussed in Albuquerque, in writing to EH, who will subsequently issue clarification guidance in a technical clarification memorandum containing the mutually agreed upon resolutions discussed at the meeting. EH plans to address the issue of selection of criticality controls for inclusion in the Documented Safety Analysis (DSA) and how to bridge between the existing criticality safety evaluations and the DSA by a revision or addendum to an appropriate DOE Standard, yet to be determined. Because this issue is not resolved, it will be carried forward as an open issue.

The fifth suggested improvement in DNFSB/TECH-29 was to establish a robust process for vertically tracing criticality controls. This suggested improvement is institutionalized in DOE-STD-1158-2002, *Self-Assessment Standard for DOE Contractor Criticality Safety Programs.* The lines of inquiry in this standard force the user to audit vertical traceability of criticality controls from criticality safety evaluation to procedures and postings. Clarity about the bases for controls helps ensure that they are interpreted accurately and appropriately maintained.

The sixth suggested improvement in DNFSB/TECH-29 was to improve DOE Field oversight of contractor criticality safety programs. This suggested improvement has been institutionalized

through the implementation of Federal criticality safety engineer qualification programs and DOE-STD-1158-2002, *Self-Assessment Standard for DOE Contractor Criticality Safety Programs*. In addition, the NCSP Manager is considering ways to leverage the expertise resident in the CSSG to assist line management at the sites. One area that may require additional resources is Federal oversight of criticality safety programs at LANL, Sandia National Laboratories, and Pantex. There is currently one qualified Federal employee located at the Albuquerque Service Center who oversees these programs in addition to a significant workload of other DOE duties. This situation may require additional surge support. Such support could be derived from other sites or the CSSG to conduct assessments or review documents. This is an issue that will require close monitoring and therefore, will be carried forward as an open issue.

The seventh suggested improvement in DNFSB/TECH-29 was to enhance operator training and participation in the NCSP. Operators must be involved in the process used to develop procedures and controls for their operations so they "own" them and understand the bases for them. The seventh suggested improvement in DNFSB/TECH-29 is institutionalized in DOE-STD-1158-2002, *Self-Assessment Standard for DOE Contractor Criticality Safety Programs.* The lines of inquiry in this standard force the user to audit the degree to which operations managers and operators are involved in development of controls so that 1) controls and their technical bases are understood; 2) there is rigorous adherence to procedures and controls; and, 3) a process exists for feedback and improvement.

The eighth suggested improvement in DNFSB/TECH-29 was to formalize rigorous contractor self-assessments. DOE Policy 450.5, *Line Environment, Safety and Health Oversight,* established expectations for contractor self-assessment programs. Promulgation of guidance in DOE-STD-1158-2002, *Self-Assessment Standard for DOE Contractor Criticality Safety Programs*, institutionalized a common framework upon which to base contractor criticality safety self-assessment programs. DOE Field elements are conducting formal assessments of contractor criticality safety programs, and the contractors are conducting self-assessments. Section 10 below contains more information regarding criticality safety program assessments.

The ninth suggested improvement in DNFSB/TECH-29 was to enhance surveillance and configuration management of nuclear criticality safety-related design features. Revisions to DOE O 420.1A in 2002 (sections 4.5.1.2 and 4.5.1.3) institutionalized the requirement to conduct periodic surveillance and configuration management of design features that provide protection from inadvertent criticality.

The tenth and final suggested improvement in DNFSB/TECH-29 was to develop a robust, consistent method for reporting criticality safety infractions. Sites have some form of graded infraction reporting program. These are similar in design and have reduced over-reporting. The Criticality Safety Coordinating Team (Federal criticality safety professionals at the Field Offices) monitors reportable and non-reportable criticality safety deficiencies and shares lessons learned. The Criticality Safety Coordinating Team (CSCT) is proactively improving its capability in the area of tracking and trending.

4. Effectiveness of actions DOE has taken in addressing DNFSB letter of July 20, 2001

In response to the DNFSB letter of July 20, 2001, the DOE took several actions to institutionalize the NCSP and enhance operational criticality safety programs. The effectiveness of the DOE response to the July 20, 2001, DNFSB letter and a description of how the actions have been institutionalized are presented in this section.

The first issue raised in the DNFSB Letter of July 20, 2001, involved stability of funding for the NCSP. The NCSP funding has been stabilized. Institutionalization of the NCSP funding requirements has been accomplished by including them as a separate line in the Readiness and Technical Base and Facilities portion of the NNSA annual budget request. More detail on the budget situation is contained below in Section 6.

The second issue raised in the DNFSB Letter of July 20, 2001, involved potential relocation of the LACEF. The DOE agrees that availability of an experimental criticality test facility is an important element of the DOE criticality safety program. The LACEF is located at LANL TA-18. Every effort is being made to carefully plan the relocation of LANL TA-18 to minimize operational impacts. More detail on the LANL TA-18 Mission Relocation Program (MRP) is provided below in Section 7.

The third issue raised in the DNFSB letter of July 20, 2001, involved the adequacy of contractor criticality safety qualification plans. As reported in a letter to Chairman Conway dated August 7, 2002, DOE reviewed contractor criticality safety qualification plans. Overall, contractor implementation of criticality safety qualification plans has been effective. More discussion of this topic is provided below in Section 8.

The fourth issue raised in the DNFSB Letter of July 20, 2001, involved the status of a CSSG review of the DOE's Implementation Guides for Title 10 of the Code of Federal Regulations, Part 830, *Nuclear Safety Management*. The CSSG provided input to EH on the implementation guides. EH met with the CSSG on three occasions to resolve the remaining open issues. After meeting with the CSSG at the New Orleans American Nuclear Society meeting, there are fundamentally only a few remaining issues. In January, 2004, the EFCOG Safety Analysis Group, the DOE criticality safety community, and EH met in Albuquerque to continue discussions towards resolution. A path forward for resolving most of the issues was determined. The criticality safety community and EFCOG will issue their recommendations that were discussed in Albuquerque, in writing to EH, who will subsequently issue clarification guidance in a technical clarification memorandum containing the mutually agreed-upon resolutions discussed at the meeting. Because this issue is not resolved, it will be carried forward as an open issue.

The fifth and final issue raised in the DNFSB Letter of July 20, 2001, involved the need to retain qualified Federal criticality safety personnel at DOE Field and Site Offices. Fully trained and qualified DOE nuclear criticality personnel are in place throughout the complex to provide line

oversight for contractor criticality safety programs. Section 9 below provides more information on qualified Federal employees.

5. Current NCSP Five-Year Plan

The NCSP Five-Year Plan contains details on the NCSP structure, budget and scheduled activities. A copy of the latest version of the plan, dated November 2003, is attached.

6. NCSP funding

NCSP funding has never been more stable. Table ES-1 of the NCSP Five-Year Plan (attached) contains the planned funding levels for Fiscal Year (FY) 2004 through 2008. This level of funding is adequate for maintaining capability in all areas and addressing identified requirements. The NNSA commitment of $9.8 million in FY 2004 is firm, and all funds have been distributed according to the Work Authorization Statement text contained in Appendix B of the NCSP Five-Year Plan. The FY 2005 funding ($10.626 million) identified in Table ES-1 of the Five-Year Plan is in the President's FY 2005 budget request that will be submitted to Congress in February 2004.

Defense Programs is committed to continuing to provide adequate support for the NCSP. In the FY 2005 budget submission, NCSP funding was moved from the "Special Projects" category of the Readiness in Technical Base and Facilities Program budget to the "Program Readiness" category. This adjustment was made to reflect the broad technical support the NCSP provides to operations with special nuclear material throughout the DOE complex.

7. Critical experiments status and Los Alamos Technical Area 18 Relocation Program status

The critical experiments program at Los Alamos is making steady progress. By the end of Calendar Year 2003 all five critical assemblies were operational. Six critical experiments were completed and four benchmarks were published in the *International Handbook of Evaluated Criticality Safety Benchmark Experiments*. In FY 2004, plans include 10 experiments and publication of 6 benchmarks. More detailed information on the critical experiments program is contained in Section 6 and Appendix F of the NCSP Five-Year Plan.

As for the LANL TA-18 MRP, the conceptual design phase was completed during Calendar Year 2003 for moving the missions to the Device Assembly Facility (DAF) at the Nevada Test Site. The Critical Decision (CD)-1 package (Approve Preliminary Baseline) was delivered to Defense Programs on January 20, 2004. Preliminary Design is expected to begin in the spring of 2004. The DNFSB staff was provided with copies of the CD-1 package and is participating in design reviews. The TA-18 MRP Program Manager, Ms. Tracey Bishop (NA-117), is the Defense Programs point of contact for DNFSB interface for this activity.

Regarding the relocation of the critical experiments and criticality safety-training missions, high priority is being given to reduction of impacts to operations during transition from LANL to the Nevada Test Site. A detailed transition plan was submitted as part of the CD-1 package and will be carefully reviewed and improved throughout the design process. Transition is on the critical path for the TA-18 MRP. Both the NCSP Program Sponsor (NA-11) and the NCSP Manager are committed to maximize availability of critical experiments and training capabilities throughout the relocation of these important Defense Program missions. Phased transition of critical assemblies and associated special nuclear materials, detailed operational readiness review planning, table-top DAF operations exercises, comprehensive staff planning, and planned installation of a state-of-the-art high-speed secure video/data-acquisition system at the DAF with a link to LANL are examples of steps being taken to reduce transition time and risk and enhance operational safety and efficiency.

8. Status of contractor criticality safety engineer training and qualification programs

The DOE issued a comprehensive training and qualification standard for contractor nuclear criticality safety staff, DOE-STD-1135-99, *Guidance for Nuclear Criticality Safety Engineer Training and Qualification*, and implementation of a training and qualification program was required by a subsequent revision to DOE O 420.1a. Each site with criticality safety concerns has implemented a contractor criticality safety engineer training and qualification program that meets the intent of DOE-STD-1135-99.

Furthermore, most of the contractor criticality safety training and qualification programs were independently reviewed by EH. The EH review of contractor qualification programs at Savannah River, British Nuclear Fuels Limited Oak Ridge, Bechtel-Jacobs Oak Ridge, Hanford (Fluor, Bechtel, Pacific Northwest National Laboratory), BWXT Idaho, Argonne National Laboratory, Lawrence Livermore National Laboratory, BWXT Y-12, and Pantex concluded that their programs comply with the intent of DOE-STD-1135-99, with varying degrees of specificity. EH arranged for several presentations to be made on best practices in training and qualifying contractor criticality safety engineers at the November 2002 NCSP meeting held in conjunction with the Winter Meeting of the American Nuclear Society meeting. The purpose of these presentations was to foster more consistency and encourage implementation of best practices. The sites making presentations were Lawrence Livermore National Laboratory, Y-12 and the East Tennessee Technology Park (ETTP), Bechtel Jacobs Corporation (BJC).

Subsequently, qualified DOE Field personnel have reviewed criticality safety qualification plans for Rocky Flats, Pantex, Sandia National Laboratories, and LANL and judged their plans to be adequate as well.

The overarching goal of this effort to establish reliance for criticality safety at each site on a group of formally trained and qualified criticality safety engineers has been met and institutionalized.

One element of the qualification program has been particularly effective. It is essential that criticality safety engineers gain familiarity with operations they are analyzing prior to performing independent criticality safety evaluations. The qualification programs require that criticality safety engineers spend a specified amount of time in a facility, gaining familiarity with equipment, procedures, the facility itself, and operations as a prerequisite for performing independent evaluations. Reviews of the implementation of site programs show that only criticality safety engineers with familiarity with the facilities and operations are producing evaluations.

The numbers of qualified criticality safety engineers, the number of those in training, and open criticality safety positions for the site/contractors are shown below.

Argonne National Laboratory: 8 qualified and 2 in training
LLNL: 9 qualified and 1 open position to be filled.
Hanford (Fluor Hanford): 16 qualified and 1 in training
Idaho (BWXT): 8 qualified
LANL: 6 qualified
Sandia National Laboratories: 2 qualified
Pantex: 2 qualified
Rocky Flats: 3 qualified
Y-12 (BWX Technologies): 36 qualified and 3 in training (Note: There are 8 open positions to reduce reliance upon subcontractor support. A mix of recent graduates and experienced personnel will fill these positions. The current staffing level is adequate at Y-12; this effort is to adjust the mix of internal staff and subcontractors.)
ETTP (British Nuclear Fuels Limited): 5 qualified
ETTP/Portsmouth/Paducah (BJC and its major subcontractors): 24 qualified and 4 in training
Oak Ridge National Laboratory: 2 qualified and 1 in training
Savannah River (Westinghouse Safety Management Solutions): 27 qualified, 2 in training, and 1 open position expected to be filled in January.

DOE criticality safety staff who are in the field supporting line management monitor their contractors' staffing levels and budget requests. If they discover shortfalls, they appropriately advise DOE line management at the field/site office level.

9. Status of Federal criticality safety engineer training and qualification programs

The DOE has made tremendous strides in improving its criticality safety expertise in recent years. This has been accomplished by hiring additional, experienced criticality safety professionals and by ensuring that all DOE staff overseeing criticality safety are formally trained and qualified.

DOE has hired criticality safety staff with significant criticality safety experience as practitioners to improve its criticality safety expertise. Individuals with more than a decade of experience

practicing criticality safety have been added to DOE's staff at EH, Rocky Flats, Idaho, Richland, and Oak Ridge over the past several years. In some cases, the individuals have several decades of criticality safety experience and are recognized nationally as experts in the field. These individuals fill GS-14 or Excepted Service level positions, which is indicative of the DOE's commitment to hire and retain exceptionally qualified staff.

The DOE issued comprehensive training and qualification standards for DOE staff. The DOE staff expectations were developed initially as a new Technical Qualification Program (TQP). Each site/area office has a criticality safety specialist qualified according to the TQP requirements. In several instances, oral examination boards made up of experts from the CSSG were held as part of the qualification process. A May 26, 1999, letter to Chairman Conway described the TQP developed for Federal staff. A February 22, 2001, letter to Chairman Conway reported that at least one Federal employee at each site with a criticality safety program had been qualified to the DOE qualification standard. The requirement to train and qualify DOE criticality safety staff is institutionalized. The TQP was revised and reformatted into a new DOE technical standard in 2003. This revised and updated Criticality Safety Functional Area Qualification Standard (DOE-STD-1173-2003) was issued in December 2003. This standard did not change the technical substance of the qualification program but represented a fundamental format change. It did update some ancillary expectations that will be addressed by line management as appropriate under individual professional development plans at the site level. There is no need or intent to requalify individuals based upon issuing the TQP as a DOE technical standard. These qualified Federal nuclear criticality safety personnel comprise the voluntary membership of the DOE CSCT that is chartered by the NCSP Manager.

The number of qualified Federal criticality safety engineers and the number of those in training are shown below:

Livermore Site Office: 1 qualified
Richland Operations Office: 1 qualified (Note: This individual provides criticality safety support to the Office of River Protection as well.)
Idaho Operations Office: 2 qualified and 1 in training
NNSA Service Center in Albuquerque[(1)]: 1 qualified and ¼ full-time equivalent (FTE) in training
Los Alamos Site Office[(1)]: 0 qualified and ¼ FTE in training
Sandia Site Office[(1)]: 0 qualified
Amarillo Site Office[(1)]: 0 qualified
Nevada Site Office[(2)]: 0 qualified
Y-12 Site Office: 1 qualified and 1 FTE subcontractor support
Savannah River Operations Office: 2 qualified and 2 in training
Rocky Flats Field Office: 0 qualified (Note: 1 qualified DOE staff member is stationed at Rocky Flats but reports to EM Headquarters)
Oak Ridge Operations Office: 2 qualified
Chicago Regional Office: 1 qualified
Office of Environment, Safety and Health: 1 qualified

Office of Independent Oversight: 1 qualified

Notes:

(1) There is currently one qualified Federal employee located at the Albuquerque Service Center who provides oversight of the criticality safety programs at LANL, Sandia National Laboratories, and Pantex, in addition to a significant workload of other DOE duties. This situation may require additional surge support. Such support could be derived from other sites or the CSSG to conduct assessments or review documents. This is an issue that will require will require close monitoring and therefore will be carried forward as an open issue.

(2) Currently there is no requirement for qualified Federal staff at the Nevada Site Office. If the decision is made to relocate TA-18 to the Nevada Test Site, this situation will be re-evaluated and a determination will be made about Federal criticality safety oversight prior to the relocation.

10. Lessons learned from criticality safety program assessments

The mandatory ANSI/ANS-8 standards for criticality safety require criticality safety audits and self-assessments. In particular, every fissile material operation must be reviewed frequently, at least annually. Generally speaking, some sort of contractor self-assessment, either by operations staff or the nuclear criticality safety staff, occurs monthly in some portion of any given plant. The requirement to review every fissile material operation is usually met by performing a systematic schedule of assessments over a small portion of the facility/site monthly, with the roll-up covering all areas in a year. Most site contractors utilize criticality safety committees in addition to line operations and nuclear criticality safety staff audits/assessments. The nuclear criticality safety committees often include external expertise to advise contractor management. Finally, it is a common practice for contractors to perform biennial or triennial comprehensive criticality safety program reviews by teams comprised of some mix of internal and external expertise. Standard practice at the sites is to capture findings from all these types of self-assessments in a site-specific corrective action-tracking database that contractor management uses as tool to ensure that improvements occur.

It is important to differentiate self-assessments findings and observations from criticality safety deficiencies/infractions. The former are often programmatic or reflect deviations from expected policy or practice that do not involve specific criticality safety limits and controls. The latter explicitly arise from deviations from approved criticality safety limits, controls, and procedures as derived from criticality safety evaluations.

Site DOE criticality safety staff ensures that contractors have programs and procedures in place for performing the required self-assessments. This assurance is gained by conducting DOE line criticality safety assessments/reviews on an ongoing basis. These assessments examine program

documentation, spot-checking self-assessment and corrective action-tracking reports, and frequently examining individual criticality safety evaluations and limits. DOE site criticality safety staff periodically tour fissile material facilities and operations, usually as a team with Facility Representatives. Site DOE criticality safety staff do not, in general, review every report of every audit/self-assessment performed by the contractor. DOE site line management holds its contractor management responsible for maintaining awareness of criticality safety issues and concerns based on feedback from all assessments and implementing corrective actions as needed.

If contractor self-assessments do identify criticality safety deficiencies/infractions, these are reported to contractor management and to the site DOE criticality safety staff. The site DOE criticality safety staff, collaborating with the CSCT, will then track and trend all criticality safety deficiencies/infractions.

The DOE issued a formal technical standard, DOE-STD-1158-2002, *Self-Assessment Standard for DOE Contractor Criticality Safety Programs*, as an aid to establish consistent, high-quality self-assessments. This standard was written with the intent of the entire scope being covered at a site approximately every three years. Properly implemented, such a systematic self-assessment program will maintain best practices consistent with the expectation of the mandatory standard ANSI/ANS-8.19.

Most DOE contractors have incorporated DOE-STD-1158-2002 in some fashion as part of their ongoing self-assessment program. Some use it as part of their criticality safety committee protocol, some use it as part of their monthly self-assessment programs, and others utilize it for their biennial/triennial reviews. Typically, when site DOE offices conduct assessments of their contractor's criticality safety programs, the lines of inquiry from this standard are utilized.

In addition to these ongoing systems of line management self-assessments at the DOE site and contractor management level, DOE recently baselined its criticality safety programs. In 1999-2000 the DOE required each site to perform comprehensive self-assessments to what is now the DOE-STD-1158-2002 criteria. These self-assessments were forwarded to EH and independently reviewed by EH, who was chartered with the mission of following up on sites pending the results of the review. EH began this task in 2000 with a follow-up review at the ETTP. In addition, EH was tasked by the Deputy Secretary with conducting an independent review of five major sites and reported the results to the Secretary in 2000. To date, every site, except BJC operations at ETTP, has been shown to meet the expectations of ANSI/ANS-8.19 through assessments to criteria now embodied in DOE-STD-1158-2002. The DOE Oak Ridge Site Office is conducting a comprehensive review of the BJC program at ETTP in January 2004. If this review shows the BJC program is adequate, then every site with potential criticality hazards will have been reviewed and shown to meet the requirements of DOE-STD-1158-2002 and ANSI/ANS-8.19 which forms the basis for the DOE self-assessment standard.

Finally, four major DOE site self-assessments were conducted during Calendar Year 2003. These are listed below along with summarized results.

- January 2003: Review of British Nuclear Fuels Limited (BNFL) ETTP Criticality Safety Program by the Oak Ridge Operations Office.

  Results: The BNFL criticality safety program met the intent of the required ANSI/ANS standards and was adequate to support planned decontamination and decommissioning operations at ETTP. There were no significant findings.

- January 2003: Review of the LANL Criticality Safety Program by NNSA Service Center.

  Results: The LANL training and qualification program still needed approval; a program to track criticality safety findings/deficiencies was needed; and additional work was needed to track non-reportable deficiencies. The LANL nuclear criticality safety committee is functioning. The contractor is using the equivalent of DOE-STD-1158-2002 as its self-assessment criteria in the form of the ANSI/ANS-8.19 criteria directly.

- August 2003: Review of the Fluor Hanford Portable Non-Destructive Assay (NDA) Program Supporting decontamination and decommissioning by the Richland Operations Office.

  Results: Additional management attention is needed in the near term to establish a properly staffed, qualified, and accurate NDA program with the capabilities of supporting accelerated decontamination and decommissioning. The contractor has developed a corrective action plan. The Richland Operations Office is tracking the plan.

- October 2003: Review of the Fluor Hanford Plutonium Finishing Plant (PFP) Criticality Safety Program by the EM Headquarters (EM-5).

  Results: The review of the Fluor Hanford PFP revealed no significant findings against the criticality safety program. The Richland Operations Office is tracking the improvement actions that Fluor Hanford committed to as a result of the review.

In summary, the DOE site offices and their contractors are performing self-assessments. No imminent criticality safety concerns were found in 2003. Self-assessment processes are in place to allow site line management to maintain criticality safety programs that meet the expectations of the ANSI/ANS-8 standards.

11. Lessons learned from CSSG reviews

The CSSG is chartered to advise management on operational criticality safety, provide the technical basis for supporting all activities within the NCSP, and review DOE orders, standards, and rules. The CSSG has performed some specific reviews at the request of DOE Program

Managers [e.g., the Hanford Multi-Canister Overpack, the Paducah Criticality Accident Alarm System, Waste Isolation Pilot Project (WIPP) criticality safety limits, and the preliminary design of the Pit Disassembly and Conversion Facility] through taskings initiated by the NCSP Manager. In some cases, the feedback has been formal and written (e.g., Hanford Multi-Canister Overpack andWIPP criticality safety limits). In other cases, the CSSG feedback has been informal and verbal (e.g., the Pit Disassembly and Conversion Facility). In any case, aside from reports generated by the CSSG, lessons learned from their reviews have several avenues for dissemination: NCSP web site; CSCT monthly teleconferences; and discussions with the End Users Group at the bi-annual NCSP meetings held in conjunction with the American Nuclear Society meetings.

Finally, the NCSP Manager is considering establishing a process whereby the expertise resident in the CSSG is leveraged to assist site office management in assessing the state of criticality safety programs periodically at the sites. One proposal under consideration is to use a subset of CSSG members to visit a site and provide feedback directly to the site manager. This proposal will continue to be developed in conjunction with corrective actions resulting from the internal NNSA review of the Columbia Accident Investigation Board report. If the site office managers consider the proposal useful, a pilot site visit would be scheduled later in calendar year 2004. If the pilot is successful, more visits would be scheduled. In addition, a way to promulgate lessons learned during CSSG reviews would be developed. Optimizing the use of CSSG expertise to assist site office and contractor line management and developing a system for sharing lessons learned are issues that will require resolution and therefore will be carried forward as open issues.

12. Trending and analysis of reportable and non-reportable criticality safety occurrences

The DOE CSCT meets via teleconference each month to discuss new initiatives in criticality safety, major criticality safety reviews/assessments, and reportable and non-reportable criticality safety infractions/deficiencies. In 2003 the CSCT added the informal discussion of all criticality safety infractions/deficiencies to the monthly agenda in order to share lessons learned informally.

The one theme that emerged from the informal discussions of criticality safety-related events is the need for accurate NDA with well-characterized uncertainties to support decontamination and decommissioning activities within the DOE. Several sites experienced criticality safety-related issues related to decontamination and decommissioning activities throughout the year (i.e., Rocky, Hanford, Paducah, and ETTP). DOE field offices are taking action to improve the quality of NDA through appropriate corrective action plans developed by the contractors at the site level.

In late 2003, the CSCT worked to improve its ability to characterize deficiencies and infractions to better deduce lessons learned, share the information across sites more efficiently, and develop effective corrective actions. The CSCT undertook the development of a web-based database for

tracking/trending reportable and non-reportable criticality safety deficiencies and infractions. The data that will be used to populate this database is already collected by the contractors as part of their requirements to comply with ANSI/ANS-8.1 and 8.19. The CSCT plans to analyze the occurrences and upload the data monthly. The database became operational in January 2004 and is accessible only by CSCT members, in order to protect the integrity of the data. The information used by the CSCT for this purpose is input into the database in the format shown below. The CSCT will track/trend deficiencies/infractions monthly using this protocol, beginning in 2004 and will work to improve the system as experience is gained in this effort.

CSCT Infraction Reporting/Tracking Format

Date:
Site:
Building/Facility and Contractor:
Reporting CSCT Member:
Discovered by (Contractor/DOE; Criticality Safety/Operations):
ORPS Reportable (Y/N):
Brief Description of Operation:
Brief Description of Infraction/Deficiency:
Infraction/Deficiency Category (List all that apply):

- Mass
- Volume
- Concentration
- Spacing/Interaction
- Labeling
- Unauthorized/Improper Transfer or Location
- Unauthorized/Improper Fissile Material Type/Form
- Improper/Inadequate Criticality Safety Posting
- Unauthorized/Improper Containers
- Unauthorized/Unanalyzed Operation
- Operation without Criticality Safety Posting/Limits
- Moderation/Flooding/Wetting
- Criticality Safety Alarm System Failure
- Limiting Condition for Operations Violation
- Technical Safety Requirement Violation
- Other (Describe)

Causal Factors (List all that apply):

- Less Than Adequate (LTA) Work Planning/Hazards Analysis
- LTA Pre-Job Walk-Down
- LTA Pre-Job Brief

- LTA Fissile Handling/Operational Procedures
- LTA Policies or Program Procedures
- LTA Training
- Failure to Follow Operational Procedures
- Failure to Follow Policies/Program Procedures
- Equipment Failure/Error
- Discovery of Pre-Existing Condition
- LTA Criticality Safety Evaluation
- Software Failure/Error
- Surveillance Failure
- LTA Assay of Material
- LTA Materials Control and Accountability
- Other (Describe)

13. Open issues identified in the previous annual report

Although this is the first report and no open issues have been previously identified, several unresolved issues have been identified in this report and will be carried forward as open issues. These are:

- Optimizing the use of CSSG expertise to assist site office and contractor line management and developing a system for sharing lessons learned;
- Resolution of issues surrounding the relationship between criticality safety evaluations/controls and authorization basis documents;
- Resolution of issues regarding the way criticality safety is addressed in the DOE Implementation Guides for Title 10 of the Code of Federal Regulations, Part 830, *Nuclear Safety Management*;
- The potential relocation of LACEF activities conducted at LANL TA-18; and
- Federal oversight of LANL, Sandia National Laboratories, and Pantex criticality safety programs.

14. Conclusion

Overall, actions taken in response to Recommendation 97-2, DNFSB/TECH-29, and the DNFSB letter of July 20, 2001, have been very effective and substantially improved the DOE criticality safety infrastructure and operational programs. Funding has been stabilized and the NCSP has been organized to maintain capability while addressing the most pressing operational criticality safety needs. Both the LACEF and the Oak Ridge Electron Linear Accelerator are recognized as important contributors to the NCSP and are being supported. Training and qualification programs have been established and are functioning. Pertinent criticality safety information is readily available on web sites supported by the NCSP, and feedback from the criticality safety community is being used to plan program work. Through implementation of the NCSP, a viable process for assessing needs and enhancing criticality safety has been institutionalized.